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Indian Standard

METHOD FOR METALLOGRAPHIC SAMPLE PREPARATION OF HARDMETALS

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Indian Standard

METHOD FOR METALLOGRAPHIC SAMPLE PREPARATION OF HARDMETALS

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(*Continued from page* 1)

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0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 29 November 1985, after the draft finalized by the Powder Metallurgical Materials and Products Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 With the increasing use of hardmetals, a need has been felt for having standards on the metallographic examination. This standard is one of the series on this subject. It is hoped that the formulation of this standard will be of considerable use to the industry.

0.3 In the preparation of this standard, assistance has been derived from ASTM B 665-79 Metallographic sample preparation of cemented carbides, issued by American Society of Testing and Materials.

0.4 In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes a method for preparing hardmetal samples for metallographic examination.

2. SELECTION OF SPECIMEN

2.1 Hardmetals are very often in the form of relatively small pieces; it is possible to select and mount the entire piece in such a manner as to permit examination of the entire cross section. When pieces are too large for this, however, they should be sectioned, using a diamond cut off wheel, to allow viewing as much of a representative cross section as possible. For micrograph the area selected should represent, as nearly as possible, the entire cross section.

*Rules for rounding off numerical values (*revised*).

3. PREPARATION OF SPECIMEN

3.1 There are several methods for preparing hardmetal surfaces for metallographic examination. Basically, they all employ diamond wheels for grinding and diamond paste or diamond powder for lapping. The grinding practices differ to a minor degree, with respect to the grit size of diamond. In all practices, however, the final polish is produced by extremely fine diamond powder or diamond paste lapping and in all practices care must be exercised to retain the microstructure in its true form and to avoid pull-out of the softer matrix material (usually cobalt).

3.1.1 *Mounting* — Where possible, specimens should be mounted in a plastic material such as phenol-formaldehyde or poly-methyl methacrylate to facilitate polishing without rounding the edges. Large specimens may be polished without mounting. When specimens are too large they may be sectioned using a diamond cut-off wheel or they may be fractured (appropriate safety precautions should be taken while fracturing specimens). The area selected for examination should represent, as nearly as possible, the entire cross section.

3.1.2 *Rough Grinding* — The surface to be examined may be ground flat on a surface grinder with a resin-bonded diamond wheel (100 to 220 grit) operated at 25 to 28 m/s. After the surface is flat, several clean-up passes are required; the maximum depth of cut is 13 μm per pass and cupious amounts of coolant are used.

3.1.3 *Polishing* — Polishing is done in three steps using diamond powder or paste on a synthetic short-napped cloth (the reverse side of photographic paper). When automatic polishing equipment is used, a resin-bonded diamond disk may be substituted in the roughing lap. For manual polishing, speeds of 500 to 600 rpm are used, automatic polishing generally requires speeds of 100 to 200 rpm.

3.1.3.1 *Roughing lap* — This lap employs diamond powder of size 15 to 25 μm dispersed in light spindle oil or an equivalent diamond paste.

3.1.3.2 *Second lap* — This lap employs diamond powder of size 4 to 8 μm or an equivalent diamond paste.

3.1.3.3 *Finishing lap* — This lap employs diamond powder of size less than 2 μm or an equivalent diamond paste.

NOTE — Best results are obtained by applying considerable pressure to the specimen in all lapping operations. Lack of adequate pressure will result in pulling out the softer matrix material (usually cobalt). It is also essential that the specimen and operators hands be thoroughly cleaned between all the grinding or polishing steps.